Hazardous Materials Tracking System Scanning Module

U.S. NAVY

in cooperation with

National Steel and Shipbuilding Company
San Diego, California

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JAN 1992	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Hazardous Materials Tracking System Scanning Module	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Surface Warfare Center CD Code 2230-Design Integration Tools Bldg 192, Room 128 9500 MacArthur Blvd, Bethesda, MD 20817-5700**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**35**	

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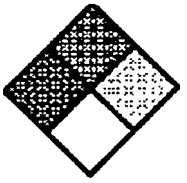

HMTS / Scan

Hazardous Materials Tracking System Scanning Module

Final Report

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Navy (DTRC) Contract N00167-89-D-0071

January 21, 1992

TASK NO. N1-84-3 MOD

Foreword

This project was performed Under the auspices of the National Shipbuilding Research Program with the direction of the SNAME SP- 1 panel. This report is the result of a six-month study of the methods, design and programming for a material safety data sheet scanning system. The approach was to use the most modern, flexible and powerful software and hardware tools available.

We would like to express our thanks to Lyn Haumschilt and T. Michael Chee of the National Steel and Shipbuilding Company (NASSCO) in San Diego for their continued support and encouragement and all the other shipyards that provided the details of shipyard operation. Appendix A lists the numerous companies and individuals who without their help this project would not have been a success.

Executive Summary

In the 1970s and 1980s, the shipbuilding industry lost some of its competitive edge to overseas shipbuilding and repair operations. Several things can be done to restore the industry to its proper place in the world market. One way is to be smarter in how it utilizes its computers. Most shipyards now possess the hardware and software but have only begun to use these resources to solve problems in the production arena. Computers no longer need to be restricted to offices; they can now become an integral part of the shop floor supervision and management tasks.

A major reason for the increased attention on hazardous chemical tracking was the passage of the Superfund Amendments and Reauthorization Act (SARA) and its predecessor, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Shipyards quickly became targeted by local environmental groups because of their location near scenic harbors and the potential for environmental damage to these areas from their daily use of hazardous materials. The level of detail now required for reporting the quantities and locations of hazardous materials to local state and federal agencies requires nothing short of a computer system with modern software and hardware tools.

During the development of the Hazardous Materials Tracking System (HMTS), it became evident that another module would be required to make the system as effective as possible in the shipyard. While HMTS records the required amount of data from the Material Safety Data Sheet (MSDS) for tracking hazardous materials in a shipyard, there are several distinct advantages in having an on-line electronic image of the MSDS readily available to shipyard personnel. The requests from several SP-1 panel members confirmed the need for this added functionality not specified in the original contract.

There have been some attempts at mainlining an electronic MSDS library and all have a number of shortfalls. If all the fields from the MSDS are entered into the system, data entry time and accuracy become an insurmountable burden. In addition, if a new MSDS is received, a word for word comparison must be done to assure that all new information is updated on the current MSDS entry. If, on the other hand, only the bare minimum amount of information is entered, MSDS information requests entailing any detail would require direct contact with the Safety or Environmental department.

Disadvantages of non-electronic, hard copy MSDS systems include: maintaining multiple identical sets of MSDSs throughout the shipyard and making sure all sets are current; maintaining old versions of MSDSs along with the most recent versions; limited access to safety information when an emergency or spill occurs; and the inability to access a particular MSDS by anything other than a sequential ID number. In other words, not being able to access a MSDS by just knowing the chemical component or manufacturer's name car-be very important when trying to determine if you already have the MSDS. Consequently, an image scanning system was developed.

The system uses a desk-top scanner in conjunction with an IBM compatible personal computer to store an exact image of the MSDS. All the information contained on the MSDS is now

directly available with only a few keystrokes. The amount of time needed to enter a MSDS is reduced from the hours it takes to manually enter the information to several minutes and there are no data entry errors. When installed on a computer network, the information becomes available at any terminal throughout the shipyard. Even installed on a single PC, updating and maintenance of the hard COPY MSDS sets is greatly reduced because of the print feature of the scanning system. MSDSs can be printed on laser or Epson-compatible printers and the copies distributed as needed.

The scanning system was developed as an extension of HMTS, but a stand-alone version was also developed. The stand-alone version scans, stores, displays and prints the MSDS in exactly the same way as the HMTS version. The difference is that only a minimum number of data fields need to be entered. This results in a small package, but it has none of the reporting abilities of the HMTS version.

A complete user's manual for the scanning process is included as one of the appendices. This manual includes installation, operation and maintenance. The HMTS scanning module can run either as a stand-alone or as an IBM PC-compatible network application.

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Before any programming was done, several other major tasks had to be completed. These preliminary tasks included: industry consultation, choosing an image scanner and software to capture the image, choosing the method of storing the MSDSs and choosing software to display the images.

Industry Consultations

Five shipyards and two manufacturing companies were contacted by telephone and asked how they presently store and handle their MSDSs, what kind of access employees have to the MSDSs and what kind of computer systems they have. While most of the companies contacted kept the MSDSs in paper form and distributed copies to several centralized locations, several made use of MSDSs entered into a computer system. The ones that used a computer system had a data entry person enter all the information from the MSDSs into the computer. Every one of them said the process was very time consuming and there was a large number of typing errors. After entering all the data, someone needed to check all entries for errors. Everyone that was contacted said they spent a large amount of time performing updates to the satellite copies or to the data entered into the computer. Almost all of the companies have either a PC-network or main-frame terminals located at various points throughout the yard. In most shipyards the scanner would be the only hardware purchase needed. This survey demonstrated the need for an alternate way of storing and providing the required access to the MSDSs.

Hardware Requirements

Since HMTS was designed for use with a 286/386 IBM or IBM compatible, the scanner needed to implement this unit needed to be capable of interfacing with the computer system. Ideally, the scanner would be a small desk-top model that included or has as an option an automatic document feeder, multiple scanning resolutions and interfaces for numerous software programs.

Early on in the research for this project it was discovered that permanently storing images required large amounts of disk space; just how much space was not realized until comparisons were run between various storage formats. After these tests, it was decided to look into large capacity storage media.

Software Requirements

To implement the HMTS scanning module, several software interface modules are required. Three programming tasks were identified. The image must first be transferred from the scanner to the computer's main memory. Then it must be stored on some permanent storage medium in a recognized format. Finally, the image must be displayed on the computer screen.

While performing the research, it was discovered that the commercial off-the-shelf software did not do all three tasks. There was software to scan, software to transfer and store the data and software to display the image on the screen. But no software did it all.

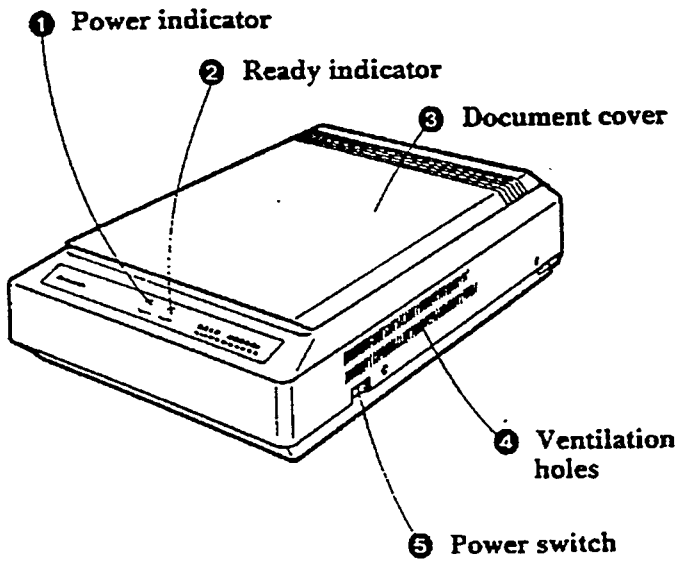
Various hardware and software tools were considered from several viewpoints: cost,

Scanner Selection

Image scanning for the Personal Computer is a fairly recent development. With the growing number of desk-top publishing applications, the scanner market has boomed. In the last eight years, the number of scanners on the market has gone from several expensive specialized systems to over 150 different products ranging from $200 hand scanners to $16,000 optical character recognition (OCR) scanner systems. It was decided to store the MSDSs as images and not as text. This decision was made due to the time involved in converting to ASCII and the fact that OCR is not yet to the point where it can read accurately 100% of the time. Only when high quality MSDSs are available will this be possible. It is critical that the information from MSDS not be transposed incorrectly when being entered into the system. For this reason, OCR was not an alternative for loading MSDS information. This not only reduced the amount of time it took to scan a document, but it also greatly reduced the cost of the scanner.

While there are several highly recommended scanners on the market that combine high quality with low price and meet the requirements, the Panasonic FX-RS307U (see Figure 1) and the Hewlett-Packard ScanJet are the best models available. Both can be purchased for around $1,600, which includes an Automatic Document Feeder (ADF).

The Panasonic FX-RS307U was chosen for the development of the HMTS scanning module. The module chosen includes Panasonic's PanaScan Plus software, the interface card and the Automatic Document Feeder. The unit measures 13 1/2 inches wide by 21 1/2 inches deep by 7 1/2 inches high. The half-size interface card works in any 16 bit interface slot. Installation and configuration are easily accomplished using the well written and easy to understand manuals.



Storage Medium

The need for a large amount of permanent storage makes this one of the more critical pieces of hardware. The criteria in selecting the storage medium are storage capacity, cost, access time and compatibility with other software.

WORM (Write Once Read Many) Optical Drive

If you are looking to store large amounts of data that will never change, this would be a good choice. A WORM drive can store more data because the laser is more precise and requires less room. The data is permanent because the data is encoded as pits on the surface of the disk. This also makes the disk immune to magnetic fields. The problem with WORM drives are the relatively high cost ($3,500 for an optical drive) and slow access times. It takes about one second to search each 2K bytes of data. The permanent nature of the data would also be a problem in this application. As MSDSs are updated, the old copies would still be on the drive, and you could have a disk with more out-of-date information than current information.

Rewritable Optical Drive

A Rewritable Optical Drive has most of the advantages and disadvantages of a WORM drive except that the data is not permanent. The drive can store large amounts of data in a small space, but access times are still slow.

Another major disadvantage of both types of optical drives is that there is no standard. Each manufacturer has their own way of storing and encoding data.

Magnetic Hard Disk Drive

The traditional Magnetic Hard Disk Drive still has the advantage of speed, cost and universality. Magnetic drives have average seek times in the range of 14 milliseconds and cost $500 per 100 Megabytes. One disadvantage when using DOS 4.0 and lower is that there is a 32MB limit on the size of a logical drive. This has been corrected in DOS 4.01 and higher.

The clear choice for the storage medium is a magnetic hard disk. It's faster and less expensive. In addition, as the size of drives on the market continues to grow, drives in the gigabyte range will become more available, and a shortage of storage space will not be a problem.

Scanning Software

The ideal scanning software would run on a single command. Invoking the command would store the page currently in the scanner with the MSDS identification number. The problem is that the software packages on the market each have some type of proprietary user interface. Many of the software packages reviewed make use of Microsoft Windows as the Interface.

Panasonic PanaScan Plus (Version 2.0)

PanaScan Plus comes packaged with Panasonic scanners. Two different formats are supported to store the images, " .PCX" and " .TIF". Files names can be up to eight characters in length and the image format is added as the extension. Even though the Panasonic can be equipped with an optional ADF as each page is scanned, it must be saved before the next page is scanned. PanaScan does not include any OCR, although it does have a drawing toolbox similar to PC Paintbrush. You can also erase or draw lines and shapes before a document is saved.

Calera WordScan Plus

WordScan from Calera is a dual purpose scanning program. Besides allowing an image to be saved directly to a file, it includes the software to do OCR or combine an image and OCR text. WordScan supports four formats to store an image, ".TIF", ".PCX", ".PDA" and " .DCX". WordScan allows you to enter only four characters as a file name as it adds "-##A" to the filename. The ## indicates the page of the document. When scanning, you are asked how many pages YOU wish to scan. The pages are kept separate in the buffer, and when they are saved, the filenames have the page number concatenated onto them. This is a plus since MSDSs are often several pages in length.

With the proper settings, both scanning systems produce east to read documents in a minimal amount of time. With a rudimentary knowledge of Windows, which is given in the manuals, both of these programs are easy to use. The HMTS scanning module is set to function with Calera WordScan Plus. Calera was chosen due to its ability to read and name multiple pages.

File Formats

The way that images are stored determines not only how readable an image is but how much storage space it needs. The resolution that an image is scanned at is multiplied by the width of the scanning area to give the number of pixels that need to be stored for each line (e.g. 150 dots per inch (dpi) * 8.5 inches = 1,275 dots per line). The number of lines is computed the same way. Then you can choose how many bits it takes to define each pixel. With one bit a pixel is either black or white, with two bits you have four shades, with four bits you have 16 shades, etc. Since all that has to be stored is a black and white image, a format using one bit will save memory and reduce the time it takes for an image to be displayed on the screen, because the software does not have to convert the extra bits to a pattern that represents each shade. The chosen format must also be compatible with the scanner, scanning software and display software, as well as use as little storage as possible. See Table 1 for a comparison of various file formats and DPI settings.

PCX

The .PCX format was developed by the ZSoft Corporation and is the format used by Microsoft's PC Paintbrush, many other fax cards, paint programs and desktop publishing programs. This format is supported by both software packages using 1, 4, or 8 bit images. The downside is the files are rather large.

GIF

The .GIF (Graphics Interchange Format) was developed by CompuServe, Inc. for transferring image files over their service. For this reason the .GIF files are about 45 percent smaller than a .PCX file. The problem is that the scanning software does not support this format. There are programs that will convert other formats to .GIF, but they take a long time (over three minutes for a 150 dpi .PCX file).

TIF

The .TIF (Tagged Image Format File) was developed by Microsoft Corporation and Aldus Corporation. It is used by some paint programs and supported by most desktop publishing-programs. This format is supported by both scanning programs. The files in .TIF format are slightly larger than those in .PCX (approximately 5%).

The choice is between PCX and TIF since the time to convert to the GIF format is unreaso in most circumstances. PCX is the format used because of its slightly smaller file size and because it is supported by a greater variety of software.

Table 1

AVERAGE NUMBER OF BYTES PER PAGE				
FILE FORMAT	100 DPI	150 DPI	200 DPI	300 DPI
PCX	44,489	94,148	152,784	302,345
GIF	27,046	52,239	78,926	141,678
TIF	46,715	98,861	160,426	317,472
ZIP	25,245	45,411	70,016	120,466
LHA	23,501	41,558	63,087	106,734
AMOUNT OF MEMORY REQUIRED TO STORE 1,000 MSDSs (EACH 4 PAGES LONG)				
FILE FORMAT	100 DPI	150 DPI	200 DPI	300 DPI
PCX	169.7MB	359.1MB	582.8MB	1153.3MB
GIF	103.2MB	199.3MB	301.1MB	540.5MB
TIF	178.2MB	377.1MB	612.0MB	1211.1MB
ZIP	96.3MB	173.2MB	267.1MB	459.5MB
LHA	89.6MB	158.5MB	240.7MB	407.2MB
TIME NEEDED PER PAGE (MIN:SEC)				
	100 DPI	150 DPI	200 DPI	300 DPI
CONVERT TO GIF	01:21.00	03:13.00	05:23.00	12:08.00
PKZIP	00:04.56	00:09.87	00:16.85	00:35.43
PKUNZIP	00:00.84	00:01:52	00:01.95	00:03.53
LHA COMPRESS	00:04.51	00:09.41	00:15.44	00:30.04
LHA EXPAND	00:01.47	00:02.49	00:03.71	00:06.45

Data Compression

During the testing of the various scanning software and file formats, the size of the image files would result in the need for an extremely large amount of storage space unless something could be done to reduce the file size. (An average .PCX file storing a single page of a MSDS and scanning at 150 dpi required over 94K.) See Table 1. Even though it would require some additional programming, it was decided to compress the files using a compression program. All test numbers given below are the averages of ten images, one page per image, scanned at 150 dpi.

PKWARE

PKWARE Version 1.01 provides two programs. PKZIP is used to compress the files, and PKUNZIP is used to extract the files back into their original format. PKWARE reduced the file size by 51.8 percent, while taking 9.87 seconds to compress and 1.52 seconds to extract. PKWARE is a licensed software package and would require purchase of a distribution license or a copy for each user.

LHA

LHA Version 2.11 uses a single command with various command options to indicate whether it is to compress or extract. LHA reduced the file size by 55.9 percent, while taking 9.41 seconds to compress and 2.49 seconds to extract. LHA is a copyright-reserved free program that can be used, copied and distributed free under certain conditions.

Even though PKUNZIP is a full second faster in extracting a file, the choice for data compression software is LHA. LHA produces smaller files and has slightly faster compression times, but the main reason for choosing LHA is that it can be distributed at no cost. The LHA user's manual states the following distribution policy:

"This software, this document and LHA.EXE is a copyright-reserved free program. You may use, copy and distribute this software free of charge under the following conditions:

1. Never change the Copyright statement.
2. The enclosed documents must be distributed as a package.
3. When you have changed the program or implemented the program for other OS or environment, you must specify the part you changed. Make a clear statement as to your name and MAIL address or phone number.
4. The author is not liable for any damage on your side caused by the use of this program.
5. The author has no duty to remedy for the deficiencies of the program.
6. When you are to distribute this software with publications or with your product, you have to print the copyright statement somewhere on the disk or on the package. You cannot distribute this software with copy protected products.

AS long as those conditions are satisfied, you do not need to get the author's permission to use or to distribute the software. "

Display Software

1.

Database Graphics Toolkit ("dGT")

The Database Graphics Toolkit from Blackhawk Data Corporation was designed to be used in conjunction with a database record. It includes modules that can be called directly from within TEAM-UP. The image viewer uses fast hardware scrolling to pan

over images which are too large for the screen. It will display images stored in .PCX, .PCL, .SCX or .GIF formats. However, dGT does not support Hercules and CGA monitors, which was a requirement of the SP-1 panel.

RML Labs Maxivu

Maxivu only displays images that have been stored in the .PCX file format. Images are displayed almost instantaneously, and it does allow for the panning of images that are larger than the screen. Maxivu has a .COM file that can be called from the DOS command line or from within TEAM-UP using the "RUN" procedure.

PCXPOD by Penguin Ware

PCXPOD allows the user to display PCX files to Hercules, CGA, EGA or VGA monitors. The software will automatically detect the type of monitor present. PCXPOD will display in both panning or full document display modes.

The time PCXPOD takes to display PCX files is minimal. The variety of options provided to the user and the numerous types of monitors that PCXPOD supports made it our choice for HMTS. Price was also a consideration; PenguinWare's $15 price was attractive.

Printing Software

Database Graphics Toolkit ("dGT")

The Database Toolkit from Blackhawk Data Corporation proved to be the only software that was reviewed which sent output to a laser printer. On the negative side, Database Toolkit does not support Epson-compatible printers.

PCXPOD by Penguin Ware

PCXPOD does support Epson-compatible printers in both simulated 9 and 24 pin. PCXPOD provides many different options in printing, including various ways to process the PCX file for printing.

Finding software to support the printing of PCX fries was difficult. It was decided that PCXPOD would again be used. It provides HMTS with the ability to print to Epson-compatible printers. It was also decided to interface with Database Graphics Toolkit in order to support laser printers.

There will undoubtedly be improvements in the display and print software for images. Our choice of products represents what was best for our research effort. It is possible that. new releases of software could change the display and image software the user chooses to integrate with HMTS. The important point to note is that there is software on the market to support the display and printing of MSDS images in a hazardous materials tracking system;

The first question to answer was how to name the files so that each was unique and identified with a particular product. Instead of adding a field to the product file, it was decided to use the six-digit product ID number followed by a dash (-) and a two-digit (01, 02, etc.) page number. The ID number would be converted from a numeric to a character field. The field would be five characters long and padded to the left with zeros (000023, 000002, etc).

By using the Product ID Number as the filename, only a single copy of a MSDS may exist for each product. If a new COPY is scanned, the old file will be written over. This guarantees that only the most up-to-date MSDS is available. If the old MSDS needs to be retained (and not written over), the user can create a new Hazardous Product record and enter the new MSDS update as its own record. Out-of-date MSDSs should be kept in hard copy paper form. The last thing that the scanning procedure does is delete all files with the extension PCX. This ensures that extra pages are not added to the next MSDS scanned.

A menu was created for the scanning, display and print procedures. The menu was assigned the [CTRL][W] function, which is found within the Product application. After selecting a particular product and entering the "Update/Browse Hazardous Product Record" screen, you will be able to scan, display or print the MSDS for that product. If the scanning software is not present, the error message "Bad Command or Filename" will appear along with a choice of whether to return to the menu or continue. Choosing to continue will report the error message and choice. Figure 2 contains the screens that have been changed to accommodate the scanning module.

Scanning Procedure

Making the call to WordScan and returning to the program was no problem, but there was no way to pass the Product ID Number. Having the user remember the ID# did not seem like a workable solution, so it was decided to have the user enter the same four-character filename. In WordScan, the user can enter MSDS as the filename, and WordScan adds the page number in the format "-OIA".

When control is returned to HMTS, a loop is started that uses a counter that is formatted as a two-character string (Page_No) with a leading zero if necessary. Page_No is concatenated onto the string "MSDS-", and "A.PCX" is added after Page_No. The Product ID# is formatted as a five-character string (ID_NO) and concatenated with Page_No and " .PCX". The RENAME command is then used to give the image file its new name.

If the error code returned by RENAME is greater than zero, the file was not found or some other error occurred and the loop control variable is set to exit the loop. The loop will continue until all the pages have been processed. After leaving the loop, all files are compressed into a single file using LHA. The individual page files are still intact within the compressed file. The file is named using the ID_NO followed by the LHA file designator ".LZH". All files with the ".PCX" extension are then deleted.

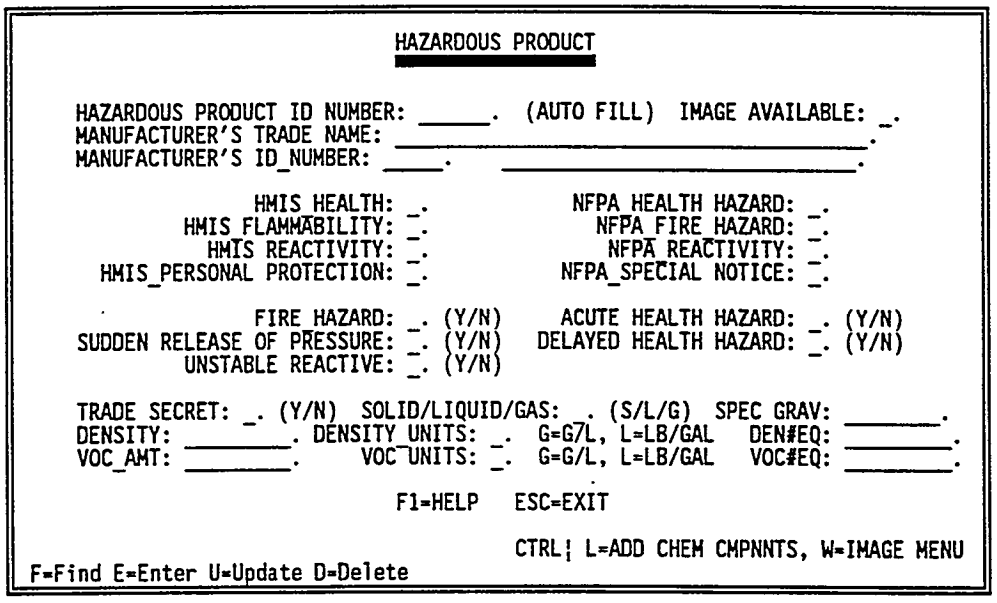
It was discovered during testing that the process of scanning many MSDSs such as a shipyard would experience when loading MSDSs already on hand was very time consuming. This is due to the fact that the normal daily practice of scanning MSDSs would not consist of a large amount of MSDSs. But, during the time period of start-up with HMTS a great deal of MSDSs may need to be scanned, possibly in the thousands. It is recommended for this special task that the user scan the MSDSs and archive them outside of HMTS. The procedure would be as follows. First, in the Calera Software, scan the MSDS. Next, save the scanned image to a disk. Once saved, the disk can be removed and a person at a second machine could perform the LHA archive process. The LHA command for this procedure would be:

Example: C:\USR\TEAMUP\LHA A \USR\TEAMUP\PCX\000050. LZH *.PCX

Where 000050 is the Hazardous Product ID#

Meanwhile, the person at the first machine could be already scanning the next MSDS. This process would considerably reduce the time to create large numbers of scanned images. Once the initial catch-up process is complete, the user should then use the scanning procedure within HMTS.

Figure 2



HSDS IMAGE SCANNING MENU

1. SCANA MSDS INTO MEMORY
2. DISPLAY MSDS ON SCREEN
3. PRINT MSDS TO LASER PRINTER
4. PRINT MSDS TO EPSON PRINTER
5. OPTIONS MENU
6. EXIT

F1 HELP SEL:

SCANNING OPTIONS

PRINTER_MODE:
SINGLE STRIKE 9 PIN = [1] SINGLE STRIKE 24 PIN= [4]
DOUBLE STRIKE 9 PIN = [2] DOUBLE STRIKE 24 PIN = [5]
QUAD STRIKE 9 PIN = [3] QUAD STRIKE 24PIN =[6]

PROCESSING: _. VERTICAL SUM = [V] INVERSE SUM = [I]

PORT: _. PARALLEL [0/1]

FUNCTION: _. SCREEN = [0] PRINTER = [P]

HORIZONTAL PROCESSING: _. SUMMING = [S] AVERAGING = [A]

VIDEO_MOOE: _. VGA = [1] EGA = [2] CGA = [3] HERC = [4] AUTO = [5]

DISPLAY: _. FULL DOC = [1] FULL WIDTH = [2] FULL PAN = [3]

F1=HELP ESC=EXIT

ENTER=SAVE SETUP, ESC=CANCEL SETUP CHANGE

Display Procedure

When entering the display procedure, the Hazardous product ID# is formatted as ID_NO, and ".LZH" is concatenated onto it. The error code is then checked. If it equals zero, the file exists and processing continues; if not, the message "MSDS file does not exist" appears. If the file exists, the compressed files are extracted.

The question now is how many pages the MSDS has. Using the error code and the copy command, it can be determined whether a file exists. A loop is started with a counter that starts at one and increments by one. The counter is formatted to a two-character string with leading zeros if necessary. The maximum number of pages for a MSDS is 99. ID_NO, the formatted counter and .PCX are concatenated together; this will match the extracted filenames. This string is used as the source filename in the RENAME procedure. If the error code returns zero, the file exists and the MSDS is displayed.

As each page of the MSDS is displayed, the user can pan around that page of the MSDS using the four arrow keys. (The Page Down and page Up keys will not function.) Pressing any other key except the arrow keys will cause an option message to appear. Pressing "Esc" will return the user to the scanning menu. Pressing "Enter" will display the next page, if one exists. The procedure then deletes all files with the extension PCX. This ensures that extra pages ar added to the next MSDS scanned.

Stand-Alone Scanning Program

The Stand-Alone was developed for use by companies that may already have some othe of hazardous material tracking system. The Stand-Alone Scanning program functions in exactly the same way as the scanning module for HMTS except that only the Hazardous Product database exists. This program can be started by entering "HAZ" on the DOS command line, or it can be called from within another program. This allows the program to function as a pure stand-alone or to become part of a larger system.

Summary

The MSDS Scanning Module provides a fast, easy and accurate way of maintaining a MSDS library. It no longer takes hours to manually enter all the data on MSDSs and verify tha data is correct. When an update is made for a MSDS, the task of comparing the old to the new is eliminated. Just scan in the new MSDS. Complete and accurate copies of the MSDSs will now be available at every computer terminal, from the safety office to the production floor.

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Appendix A: Acknowledgement

Insight Industries, Inc. would like to thank the following individuals arid corporations for assistance in making HMTS/Scan a reality.

Dana Austin, Southwest Marine, San Diego, California
Tom Bohler, Continental Marine, San Diego, California
T. Michael Chee, NASSCO, San Diego, California
Pat Gage, John Deere Dubuque Works, Dubuque, Iowa
Lyn Haumschilt, NASSCO, San Diego, California
Peter Price, Ingalls Shipbuilding Inc., New Orleans, Louisiana
Jon Remakel, AY McDonald Manufacturing, Dubuque, Iowa
Tom Snider, NASSCO, San Diego, California
Ed Warble, United States Coast Guard, New Orleans, Louisiana

Appendix B: Scanning Module User's Manual

Set-up

In order for the scanning module to function, certain programs must be loaded in specific directories. (See Appendix D for a list of all required hardware and software). PCXPOD.EXE, EXHIBIT.COM and LASRTRAX.COM must be copied into the directory USR\TEAMUP\. WordScan should be installed on the same drive that contains the HMTS program.

The directions given below for using the scanning software assume you have a mouse and a rudimentary knowledge of Microsoft Windows. It is suggested that the mouse be connected to COM2 since the Worthington Tricoder discussed in the final report of HMTS will be using COM1. If you do not, consult the user's manual for your scanning software. The scanning module will allow you to scan and store an image of a MSDS, display the MSDS on the monitor and print the MSDS on a laser printer.

After starting the HMTS program the main menu will appear.

1. Choose option "1. Hazardous Products". to display the Products search screen.

2. Enter the Product's Trade Name or the Manufacturer's Name. If you do not know either one, press the [CTRL][G], and a scrolling table will appear. You cannot scan a MSDS unless a Hazardous Product record exists.

3. Use the up and down arrow keys to move the cursor to the product you are updating.

4. When you have chosen the desired Hazardous Product, press the [ENTER] key to display the "Hazardous Product Record" screen.

5. At the bottom of the screen you will notice a list of Ctrl functions. Press [CTRL][W] to display the MSDS scanning menu.

6. Enter the desired option, and press the ENTER key when ready.

Scanning an MSDS

After you select the scanning option, Microsoft Windows is loaded.

Using Calera's WordScan:

1. Verify the following settings in the Setup Window:

   * Reading for = Image Only
   * Page Orientation = Portrait

* Type Quality = Normal
* Image Source = Scanner
* Brightness = 50 percent

If any of the first four settings are incorrect, use the pointer to click the icon to change the setting. The text description will change to indicate the selected setting. For the Brightness setting, point and click on the arrows at either end of the bar to change the setting.

2. After the setup window is correct, point and choose "Options" on the menu bar to display pop-down menu.

3. Choose "Scanner Settings... " and the Scanner Settings window will appear. The Scanner Settings should be:

   * Image Type = Binary
   * Contrast = 50 percent
   * Page Size = Letter
   * Scan Resolution = 150 dpi
   * Image Format = PCX

   If the Image Type or Page Size is incorrect, point and click on the circle next to the correct setting. The Contrast can be adjusted in the same way you changed Brightness in the Setup Window. To change Scan Resolution or Image Format, point and click on the arrow on the right side of the box. A partial list of the available settings will appear. Point and Click on the arrows on the right side of the list to view the other choices. When you can see your choice, point and click on the choice. The setting will change, and the list will disappear.

4. Point and click on the "OK" box in the upper right hand comer to exit.

5. Now you are ready to scan. Point and click on the box marked "Automatic" in the lower left-hand comer of the Setup Window.

6. The Load Scanner window will appear. Point and click on the circle corresponding to the paper path that you are using (Flatbed or Feeder). If you are not using an Automatic Document Feeder (ADF), the default setting of "Number of Pages - 1" is correct. If using an ADF, point and click on the circle next to "All pages in stack".

7. Load the scanner with the MSDS(s). If you are using an ADF, place all the pages of the MSDS in a stack, face up. with page 1 on top, followed by page .2, followed by page 3, etc. If using single-sheet flatbed, place the first page with the text facing the glass. In both cases the top of the page should face the hinge on the scanner. Point and click on the "Scan" box to start the scanner.

8. If you are scanning single pages using the flatbed, as each page is finished, the Load Scanner window returns. The starting page number has been incremented to indicate the next page. After all pages have been scanned, point and click on the "Done" box.

9. If you are using an ADF, the scanner will continue until it is out of paper. A dialogue box will appear. The box says "Scanner Empty" and offers you three choices: Stop Scanning, Add Pages and Turn Pages Over. Stop Scanning returns you to the original WordScan window. Add Pages and Turn Pages Over allows you to continue scanning by returning you to step 7.

10. You are now ready to save the MSDS.

Saving an Image

When saving a file in WordScan, be sure the file is being saved to the correct drive and directory. The HMTS program will be looking for files in the directory \USR\TEAMUP\PCX. When the scanning program is started, the directory will be changed to the directory where the scanning software is located. There will be a line that tells you the current directory (e.g. C:\PSPLUS). To change this in either program, there is a box that allows you to point and DOUBLE click to the correct directory.

1. Double C1ick on the symbol [..] until only the directory drive letter appears (e.g. C:\ ).
2. Next, point and double click on [USR].
3. Then, point and double click on [TEAMUP].
4. Then, point and click on [PCX]. The directory should now indicate the correct directory (e.g. C:\USR\TEAMUP\PCX).

Save Using WordScan:

1. The image setting must be set to PCX. If it is not, point and click on the arrow at the right side of the box.
2. Use the arrows on the right side of the image list to view the choices. Choose PCX (PCX should appear in the box).
3. Move the arrow into the box following the prompt "Document Name:". When the arrow enters the box, it will become a vertical line. Press the left button on the mouse. You can now enter the file name.
4. Type in MSDS for the filename. WordScan will automatically add four characters to the filename, and each page of the MSDS will have a unique filename. .PCX will be added as the file extension.
5. Point and click on the Save box to save the files.

Exit Scanning Module

1. Point and click on the menu choice “File”.

2. Point and click on "Exit" to exit the scanning program; you are still in Windows.
3. Somewhere on the screen, usually in the lower left-hand corner, will be an icon with the words "Program Manager" below it. Point and click on Program Manager.
4. A menu will appear. Point and click on “Close”.
5. A box will appear asking you whether to save the changes. Point and click on OK, and you will return to the Hazardous Product application. After scanning, the program must return to the Hazardous Product application for the necessary flags to be reset.

Displaying an MSDS

It is much easier to display an MSDS than to scan one. After selecting the scanning option, the first page of the MSDS will appear if it exists. If it does not exist, a message will appear telling you it does not exist.

The entire page will not appear on the screen; only a part of each page can be viewed. The four arrow keys allow You to move around on the current page. Pressing any key, other than the four arrow keys, will remove the current page from the screen and a prompt window appear.

The window contains a message and waits for your response. Press "Esc" to exit and "enter" to continue.

If you display a MSDS and find that YOU cannot make out what is on the page, you should scan it again using a higher dpi setting. The old version will be replaced by the new version. You should not automatically scan at the higher settings, because the higher the dpi, the more memory it takes to store each MSDS. A scanning dpi of 150 is suggested.

Several test *.LZH files have been included in the final system disks. The files are act pages out of a phone book. The phone page was used to show the readability of very small text and marginal quality. The files have names such as 000050.LZH designating a scanned image at 50 DPI. A file having a name such as 000100.LZH designates an image scanned at 100 DPI etc. The user can create a matching MSDS record by updating the HPID# in option 46 with the number of the image you wish to display. For example if you wish to display the 15(image, you should update the HPID# in option 46 with a 000150 and then enter a corresponding record in the Hazardous product application. You will then be able to display the record. These sample records will give you a good idea of how different DPI rates affect the display and printing options.

Printing an MSDS

The MSDS can be printed to any Hewlett-Packard LaserJet or compatible printer with at least one megabyte of memory or a Epson-compatible dot matrix printer. (To print to a laser printer, you must have a VGA monitor.) Be sure the printer is on. After selecting the appropriate option, the MSDS will be printed. A beep will sound when the printing is complete. If better

clarity is needed, the MSDS can be scanned again at a higher DPI setting. The options menu will also allow the user to enhance dot matrix printing by selecting different combinations of printing options. To change the printing options for dot matrix printing, change the mode, process, port and function. By hitting "Esc" in the Scanning Menu, all the printing and display options will be set back to their defaults.

Stand-Alone Version

The Stand-Alone version was developed for those companies that do not wish to collect all the data required by the full version of HMTS but only wish to maintain scanned MSDSs.

The Stand-Alone Scanning program functions similarly to the full version of HMTS. The Stand-Alone version Menu contains only one main application, Hazardous Products. To invoke the Stand-Alone version, the user should type HAZ at the TEAM-UP directory. The Stand-Alone version has only one username, SCAN. NO password is required. Although the Hazardous Products application will have fewer fields, the application will work the same as the full version of HMTS. Searching, printing reports, changing the terminal setup, etc., will require the same procedures as HMTS. The Stand-Alone version is installed at the same time as HMTS.

Appendix C: Hardware and Software Requirements

If you have any questions, contact:

HMTS Support
Insight Industries
One Insight Drive
Platteville, WI 53818
(608) 348-8815

ITEM	DESCRIPTION	APPROXIMATE COST
Host Computer	286 or 386 IBM PC or Compatible with 640K of RAM (minimum of 1 MB of Extended Memory and 130 MB Hard Disk is suggested, depending on the number of MSDSs)	$1,100-2,500
Scanner	Panasonic RS307U Image Scanner with Automatic Document Feeder and PC/AT Kit	$1,995
Video Monitor and Card	HERC, CGA, EGA, VGA or Super VGA, color or monochrome	$150-750
Laser Printer	Hewlett-Packard LaserJet III or compatible with at least 1 MB of RAM	$2,500
Dot Matrix Printer	Epson-compatible printer in 9 or 24 pin is suggested	$225-625
Scanning Software	WordScan Plus from Calera Recognition Systems, Inc., Santa Clara, CA (408) 986-8006	$900
Display Software	PCXPOD from PenguinWare, 7328 Platte Road, Platteville, WI (608) 348-6607	$15 Shareware
Laser Print Software	Database Graphics Toolkit ("dGT") from Blackhawk Data Corporation, 7234 West North Avenue, Suite 411, Elmwood Park, IL 60635 (708) 453-9590	$295
Host Relational Database Management Software	TEAM-UP from Unlimited Processing, Inc., 8647 Baypine Road, Suite 208, Jacksonville, FL (904) 731-8330 (Single User to 10-Workstation Multi-User)	$795-1,990
Microsoft Windows Version 3.0	Microsoft Corporation One Microsoft Way, Redmond, WA 98052-6399	$149

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